

CLAIMS:

[C001] A fuel cell assembly comprising:

an anode layer, a cathode layer and an electrolyte layer interposed therebetween; wherein at least one of said layers comprises a brittle layer having a higher fracture strength in compression than in tension; and

a stress inducer for inducing a planar compressive stress to at least one of said brittle layers.

[C002] The fuel cell assembly in accordance with claim 1, wherein said compressive stress comprises a uniaxial compressive stress induced across at least one local plane of said brittle layer.

[C003] The fuel cell assembly in accordance with claim 1, wherein said compressive stress comprises a biaxial compressive stress induced within the plane of said brittle layer.

[C004] The fuel cell assembly in accordance with claim 1, wherein said stress inducer for inducing said compressive stress comprises a prestressed reinforcement structure applied to said brittle layer.

[C005] The fuel cell assembly in accordance with claim 4, wherein said prestressed reinforcement structure is embedded within said brittle layer.

[C006] The fuel cell assembly in accordance with claim 4, wherein said prestressed reinforcement structure is applied to a second layer other than said brittle layer.

[C007] The fuel cell assembly in accordance with claim 6, wherein said prestressed reinforcement structure comprises at least one of a wire-structure or a fiber structure, or a wire-mesh structure, or a perforated sheet structure.

[C008] The fuel cell assembly in accordance with claim 1, wherein said stress inducer for inducing said compressive stress comprises a reinforcement structure applied to said brittle layer wherein said reinforcement structure has a first pre-determined coefficient of thermal expansion different from a pre-determined coefficient of thermal expansion of said brittle layer.

[C009] The fuel cell assembly in accordance with claim 8, wherein said first pre-determined coefficient of thermal expansion of said reinforcement structure is greater than said pre-determined coefficient of thermal expansion of said brittle layer; the reinforcement structure being adapted to said brittle layer at a temperature greater than an operational temperature of said brittle layer.

[C010] The fuel cell assembly in accordance with claim 8, wherein said reinforcement structure comprises an interconnect, wherein said brittle layer is applied on said interconnect at a pre-determined deposition temperature greater than an operational temperature of said brittle layer wherein the interconnect has a first pre-determined coefficient of thermal expansion greater than said coefficient of thermal expansion of said brittle layer.

[C011] The fuel cell assembly in accordance with claim 10, wherein said reinforcement structure is connected to said brittle layer in a substantially stress-free state.

[C012] The fuel cell assembly in accordance with claim 11, wherein said reinforcement structure further comprises at least one of a wire-structure, or a fiber structure or a wire mesh structure or a perforated sheet structure

[C013] The fuel cell assembly in accordance with claim 12, wherein said reinforcement structure is applied to said brittle layer.

[C014] The fuel cell assembly in accordance with claim 1, wherein the ratio of said pre-determined thickness and said unsupported width of said brittle layer is in the range from about 0.01 to about 1.

[C015] A fuel cell assembly comprising:

an anode layer, a cathode layer and an electrolyte layer interposed therebetween; wherein at least one of said layers comprises a brittle layer having a higher fracture strength in compression than in tension; and

a stress inducer for inducing a planar compressive stress to at least one of said brittle layers having a pre-determined thickness and a width;

wherein said stress inducer comprises an interconnect configured to be in intimate contact with at least one of said brittle layers;

wherein said brittle layer is applied on said interconnect at a pre-determined temperature greater than an operational temperature of said brittle layer wherein the interconnect has a first pre-determined coefficient of thermal expansion greater than said coefficient of thermal expansion of said brittle layer.

[C016] A fuel cell assembly 40 comprising:

an anode layer 14, a cathode layer 16 and an electrolyte layer 18 interposed therebetween;

wherein at least one of said layers comprises a brittle layer having a higher fracture strength in compression than in tension;

and a stress inducer 42 for inducing a planar compressive stress to at least one of said brittle layers having a pre-determined thickness and a width; wherein said stress inducer 42 comprises an interconnect 22 configured to be in intimate contact with at least one of said brittle layers; wherein said brittle layer is applied on said interconnect 22 at a pre-determined deposition temperature less than an operational temperature of said brittle layer wherein the interconnect 22 have a first pre-determined coefficient of thermal expansion less than said coefficient of thermal expansion of said brittle layer.

[C017] A method for inducing a planar compressive stress to at least one of a brittle layer of a fuel cell assembly comprising the steps of:

providing a reinforcement structure having a first pre-determined coefficient of thermal expansion to support at least one of an anode layer, a cathode layer and an electrolyte layer interposed therebetween;

wherein at least one of said layers comprises a brittle layer having a higher fracture strength in compression than in tension; and

depositing said brittle layer over said reinforcement structure at a pre-determined deposition temperature wherein the brittle layer comprises a material having a coefficient of thermal expansion different from said first pre-determined coefficient of thermal expansion of said reinforcement structure.

[C018] The method in accordance with claim 17, wherein said first pre-determined coefficient of thermal expansion of said reinforcement structure is greater than said coefficient of thermal expansion of said brittle layer; the reinforcement structure being connected to said brittle layer at a temperature greater than an operational temperature of said brittle layer.

[C019] The method in accordance with claim 17, wherein said reinforcement structure is connected to said brittle layer in a substantially stress-free state.

[C020] The method in accordance with claim 17, wherein said reinforcement structure comprises an interconnect configured to maintain intimate contact with at least one of said brittle layers.

[C021] A fuel cell assembly comprising:

an anode layer, a cathode layer and an electrolyte layer interposed therebetween; wherein at least one of said layers comprises a brittle layer having a higher fracture strength in compression than in tension; and

at least one stress inducer for inducing a planar compressive stress to at least one of said brittle layers.